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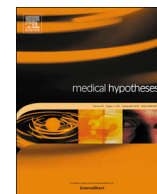
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Decision making process for amputation in case of therapy resistant complex regional pain syndrome type-I in a Dutch specialist centre

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ABSTRACT

Deciding for an amputation in case of complex regional pain syndrome type I (CRPS-I) is controversial. Evidence for favorable or adverse effects of an amputation is weak. We therefore follow a careful and well-structured decision making process. After referral of the patient with the request to amputate the affected limb, it is checked if the diagnosis CRPS-I is correct, duration of complaints is more than 1 year, all treatments described in the Dutch guidelines have been tried and if consequences of an amputation have been well considered by the patient. Thereafter the patient is assessed by a multidisciplinary team (psychologist, physical therapist, anesthesiologist-pain specialist, psychiatrist and vascular surgeon). During a multidisciplinary meeting professionals summarize their assessment. Pros and cons of an amputation are discussed, taking into account level of amputation and expectations about post amputation functioning of patient and team. Based on assessments and discussion a consensus based decision is formulated and the patient is informed. If it is decided that an amputation is to be performed, the amputation will follow shortly. If it is decided not to amputate, the decision is extensively explained to the patient.

Incidence of patients suffering from therapy resistant CRPS-I referred for amputation is low and because referred patients are strongly in favor of an amputation, a randomized controlled trial will be difficult to perform. Hence level of evidence in favor or against an amputation will remain low. We therefore report our decision making process to facilitate discussion about this difficult and delicate matter.

Introduction

Amputation in case of longstanding therapy resistant complex regional pain syndrome type-I (CRPS-I) is controversial. In a systematic review outcomes of an amputation in case of longstanding therapy resistant CRPS-I were summarized and discussed [1]. That review included 26 case studies and case series (together 107 patients) published between 1948 and 2009. Recurrence of CRPS-I, reported for 61 of the 107 patients, occurred in 31 patients. Fitting of a prosthesis, reported for 49 of 107 patients, resulted in 36 patients receiving a prosthesis but only 14 using it. Satisfaction was reported for 51 of 107 patients but it was unclear if satisfaction referred to pain reduction, increase of functional ability or prevention of infections. That review concluded that, overall outcome reporting was inconsistent and incomplete and given the available evidence, it is not possible to strongly advice against or in favor of amputation in case of longstanding therapy resistant CRPS-I [1].

In a series of clinical papers we reported on amputation of the affected limb in case of longstanding therapy resistant CRPS-I [2–4]. The

clinical outcomes after amputation for longstanding therapy resistant CRPS-I in our center appeared to be favorable; 95% (20/21) of patients reported improvements in their lives in general, 10 of 15 lower limb amputees (67%) used a prosthesis at least 8 h per day, 19 patients (90%) reported pain reduction, 17 (81%) reported an increase in mobility and 14 and 12 respectively reported improvements in sleep and mood. Overall 86% (18/21) patients would choose an amputation again [2]. Three amputees even became Paralympic athletes. However, 4 patients experienced deterioration in using the toilet and 6 felt less understood by their peers [2]. The research group of Midbari found that patients with CRPS-I who underwent an amputation of the affected limb experience less pain and a better health status assessed by means of the SF36 compared to patients with CRPS-I without an amputation [5]. Additionally, CRPS-I patients with an amputation used less medication than those without an amputation [5].

Our series of papers caught attention of patients and professionals and resulted in an increased inflow of requests for an amputation in case of longstanding therapy resistant CRPS-I.

When submitting our manuscripts to journals many reviewers

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commented on it. Below you will find: “Reviewer comments” published in the PhD thesis of Bodde and *our unpublished thoughts* [6]. “I do not think the authors have understood the pathophysiology of CRPS-I”. *Who does?* “Amputations for CRPS-I are serious disabling interventions that can be avoided with current treatment strategies”. *Which strategies did you have in mind and do you have evidence for your statement?* “It is really astonishing how many amputations were performed during the recruitment period for that study since data on amputation is very scarce in literature”. *Didn’t you read our systematic review including 26 studies describing 107 patients?* “In the US this surgery is rarely if ever considered an option”. *We think we have an alternative if everything else fails!* “The decision to amputate in these cases can be agonizing for surgeon as well as the patient”. *At last somebody who understands patients and clinicians, a rare breed.* Interestingly, Midbari and Eisenberg recently reported in a letter to the editor quite similar experiences when submitting their study about amputation and CRPS-I [7].

Within our hospital amputation in case of longstanding therapy resistant CRPS-I was frowned upon and some anesthesiologists refused collaboration to these practices and did not want to provide anesthesia for surgery. Therefore we had to find a dedicated anesthesiologist. Child physicians accused us of mall practice when a child (15 years of age) with longstanding therapy resistant CRPS-I had a *trans*-tibial amputation. She now is a Paralympic athlete.

The increased inflow of new patients, the limited evidence available, the sometimes disappointing results, the comments of reviewers and responses within our hospital made us re-evaluate the decision making process. Aim of this paper is to present the current status of our decision making process for amputation in longstanding therapy resistant CRPS-I and to stimulate discussion about this topic.

Hypothesis.

Deciding for an elective amputation in case of CRPS-I needs deliberation by an expert team of different specialists and a well-informed patient. Discussion between specialists and weighing all arguments will facilitate the decision making process resulting in an acceptable outcome.

Procedures

Screening before multidisciplinary consultation (Fig. 1)

When a patient is referred for assessment of an amputation in case of longstanding therapy resistant CRPS-I the physiatrist needs all correspondence from the referring physician. If this information is not present the information is requested. If all information is present a consultation is planned. During consultation the physiatrist takes the medical history including, education, level of activities, ADL, participation (professionally, as a partner, parent, and recreational, including sports), lifestyle (smoking, alcohol and drugs consumption) and current use of medication. Smoking should be assessed and discussed since it increases the risk for reamputation and wound complications in lower limb surgery and lower limb amputations [8–10]. Further compliance to secondary preventative measures such as cessation of smoking, a healthy diet, and > 80% compliance to drug prescription reduces cardio-vascular events and mortality after lower limb amputations [11]. Regular alcohol consumption is also considered during the decision making process since it is a risk factor for major complications after below knee amputation [12]. The physiatrist discusses sexuality, the wish for amputation and tries to exclude Body Integrity Identity Disorder (BIID), auto-mutilation, etc. During physical examination signs for self-induced lesions are looked for since in some patients with CRPS-I these lesions are present and explain part of the symptoms [13]. Additionally it is determined whether an amputation is medically necessary for instance in case of life threatening infection or gangrene. If so the vascular surgeon is consulted and an amputation is planned without

further multidisciplinary consultation. If an amputation is medically not immediately necessary, the diagnosis CRPS-I is confirmed or refuted based on history, documents and examination following current criteria (Budapest), because in some patients the diagnosis was established a long time ago on diagnostic criteria no longer applicable [14]. If the diagnosis CRPS-I is not confirmed the patient is referred back for additional diagnostic procedures and treatment. If the diagnosis is confirmed, it is checked whether duration of symptoms are present for less than 1 year. If so the patient is referred back because within the first year after the diagnosis is made many patients (partly) recover; pain, swelling, range of motion and disability improve [15]. If symptoms are present for more than 1 year it is assessed whether all treatments described in Dutch multidisciplinary guidelines have been tried (Appendix S1). These guidelines were developed based on best available evidence [16]. If not the patient is referred back for treatment according these guidelines. If all treatments have been tried without success it is assessed whether the patient is well informed about all possible outcomes of an amputation, positive as well as negative outcomes. If the patient is poorly informed and has not considered thoroughly the impact of an amputation functionally, psychologically and socially, the patient is referred back to acquire further information and further consideration. If the patient is well informed and impact of the amputation has been well considered a multidisciplinary consultation is planned and the patient is asked to write a medical history from a personal perspective and a motivation for the amputation. This expectation is based on general principles of prosthetic rehabilitation and data from our earlier evaluations of patients who received an amputation for a longstanding therapy resistant CRPS-I [2,3]. If patients are better informed prior to amputation they can have more realistic expectations about living with an amputation and if preamputation expectations are met after the amputation patients are more satisfied with outcomes [17].

Multidisciplinary consultation (Fig. 2)

During the multidisciplinary consultation the involved professionals are rehabilitation psychologist, physical therapist, anaesthesiologist-pain specialist, vascular surgeon, orthopaedic surgeon (if the patient has an orthopaedic history), and physiatrist. All professionals assess the patient on the same day for reasons of efficiency. The assessment includes psycho-social, physical and medical aspects.

Rehabilitation psychologist

Psychological factors associated with CRPS are pain, depression, anxiety, fear, catastrophizing, stressful life events, resilience and body perception disturbance [15,18–20]. The associations however are not conclusive and are not pointing in a specific direction of a personality disorder or a specific psychopathology [21–24]. To assess these factors the patient receives prior to the interview questionnaires at home and is requested to fill them in: for resilience the Connor-Davidson Resilience Scale (CD-RISC), for quality of life the World Health Organization Quality of Life Questionnaire (WHOQOL-BREF), for psychosocial distress the symptom check list (SCL-90-R), for depression the Beck depression inventory (BDI-II) and for anxiety the anxiety scale of the hospital anxiety and depression scale (HADS-A) [25–29]. Additionally a questionnaire for pain related fear (TAMPA) and pain catastrophizing scale (PCS) is filled in Refs. [30,31]. The rehabilitation psychologist assesses in a structured interview the motivation of the patient for an amputation, whether outcome expectations are realistic, and whether the patient is aware of change in body image and of the pros and cons of an amputation. An inventory of finances, housing, work, education, social support, coping, life style, household and activities is made. A screening is performed for cognitive problems and psychiatric disorders such as depression, anxiety, posttraumatic stress syndrome, BIID, auto mutilation and conversion disorders. The psychologist assesses lawsuits, currently or in the past, treatment for any mental problem,

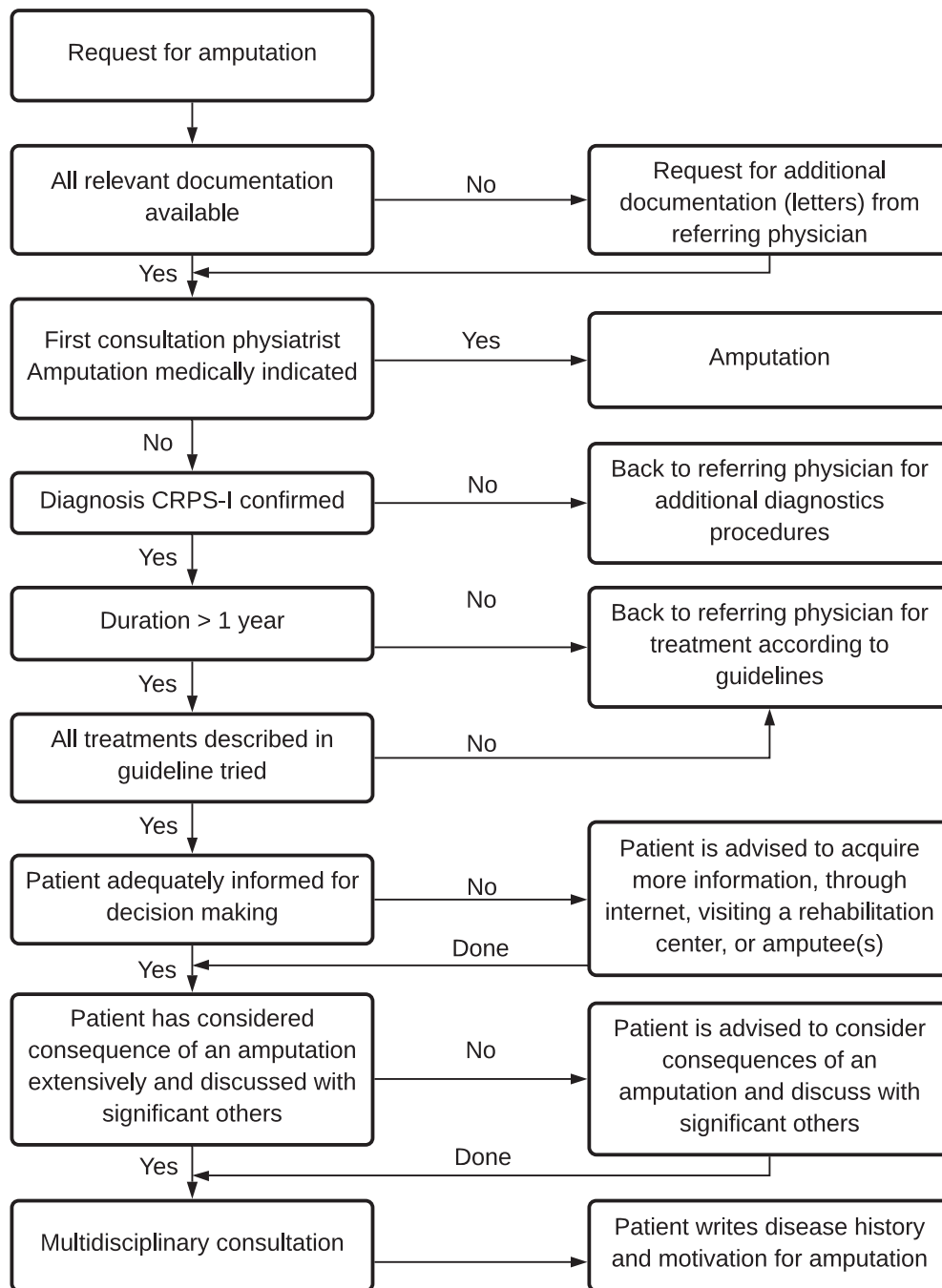


Fig. 1. Flow chart of the decision making process prior to the multidisciplinary consultation for amputation because of CRPS -I.

addiction, and outstanding or disrupting life events or adversity (for instance severe disease or death of a significant other, physical, mental or sexual abuse, molest, etc.). The results of the questionnaires together with the written motivation of the patient is discussed and used to assess the process of decision making of the patient. Was the decision discussed with significant others and friends, are outcome expectations realistic, is there a goal to achieve and how is the awareness of the complications? During this interview it is also assessed, if the patient is well prepared for an amputation, and resilient enough. What were patients reactions in the past on adversity? Are the circumstances (financial, housing, social support, life style, cognition) satisfactory? Is the CRPS connected to a lawsuit or a mental illness (BIID, auto-mutilation)?

Physical therapist

The physical therapist assesses body mass index (BMI), core stability, one leg balance, range of motion of hips and knees, muscle strength of large muscle groups of arms and legs, use of walking aids and independence of transfers. If the patient wishes an amputation but does not wish to walk with a prosthesis the assessment is limited to BMI, core stability, and one leg balance test. Although BMI is not a predictor for walking ability following lower limb amputation it should be taken into account in the decision making process [32,33]. A high BMI has shown to be a risk factor for wound complications and poorer survival in lower limb amputations [8,34]. Additionally weight is taken into account because a larger weight and a larger waist circumference is associated with less distance on the 6 min walking test [35]. An overly low BMI

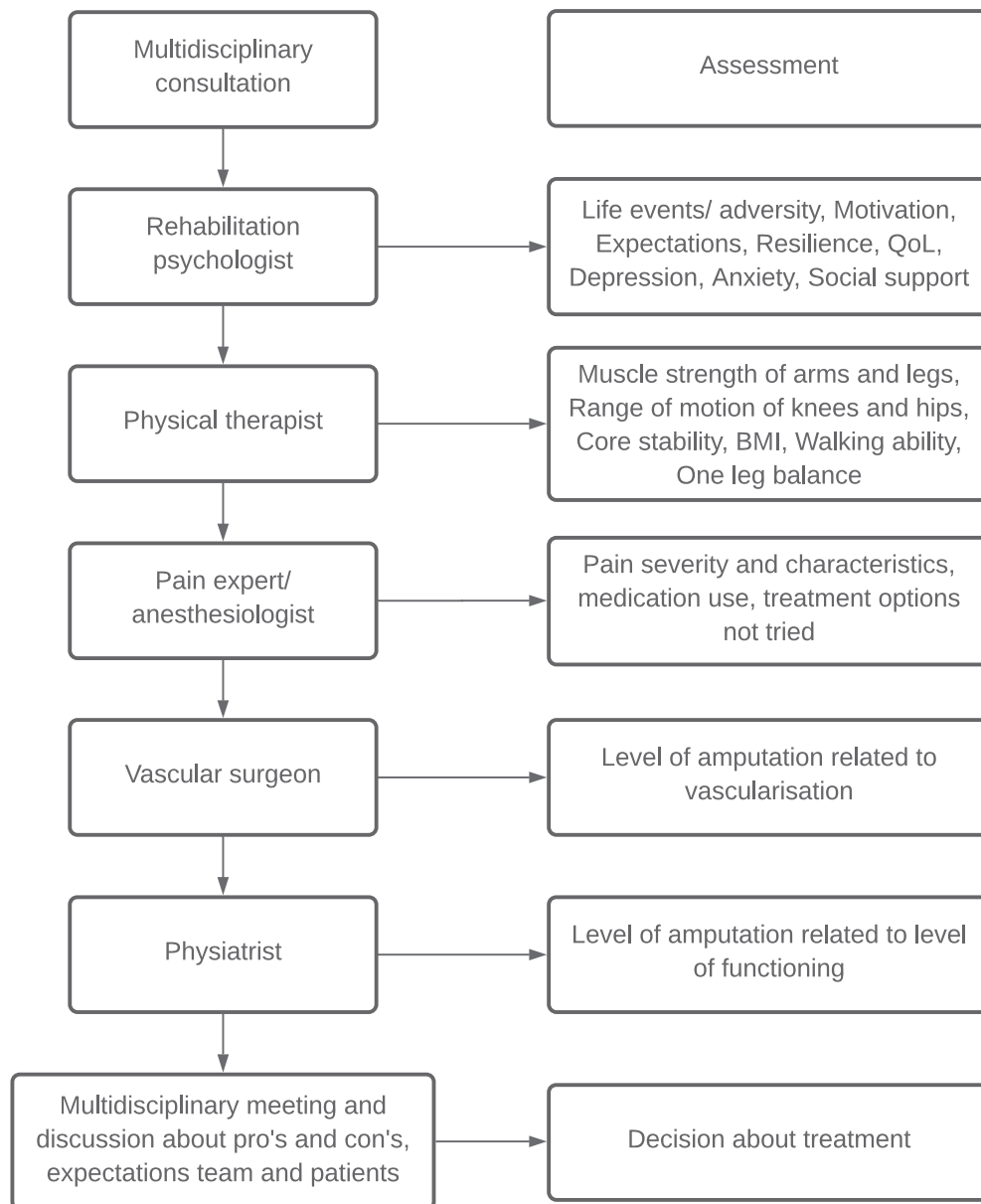


Fig. 2. Flow chart of the multidisciplinary consultations and assessment for amputation because of CRPS -I.

(< 15), is also considered since it is a risk factor for post amputation mortality in below knee amputation for critical ischemia limbs [8,35]. Results of the one leg balance test are compared to the normative values found previously [36]. One leg balance is predictor for success in prosthetic ambulation and prosthetic use [33]. A too high or too low BMI may be relative contra indications for an amputation. Sometimes a too low BMI is the result of longstanding inactivity and patients do not have enough muscles and supporting tissue to wear a prosthesis. An amputation may, however, be considered when after a dietary intervention combined with exercises BMI has increased up to 18 in case of a low BMI and muscle strength is adequate after physical therapy. In case of a too high BMI, an amputation is considered if BMI has been reduced to below 25. Also a relative contra- indication for an amputation is the lack of muscle control proximal to the proposed level of amputation or insufficient muscle control of arms or trunk. If after a training program muscle control is adequate an amputation can be performed.

Anesthesiologist-pain specialist

The anesthesiologist-pain specialist assesses pain nature, severity and characteristics, sensory disturbances, to confirm CRPS-I and to exclude other pain problems. Further impact of pain is assessed, as well as medication use and previous treatments. Special attention is paid to the patient having had reasonably all pain treatments including invasive interventions in an adequate way, according to the (revised) Dutch Guideline Type 1 Complex Regional Pain Syndrome [16]. The anesthesiologist discusses the patients expectations with respect to pain and functional gain in case an amputation will be executed. He informs the patient if expectations are not realistic. The post-operative phantom pain and stump pain incidence and potential CRPS-recurrence are brought up to help the patient consider pros and cons. If the patients' general condition gives rise to increased surgery related anesthesiological risks, the anesthesiologist discusses these also.

Vascular surgeon and physiatrist

The vascular surgeon and the physiatrist see the patient together. They again ask the patient to explain the wish for an amputation and perform a physical examination aimed at macroscopic appearance of the leg in terms of deformity and discrete signs of CRPS-I, including the most proximal level of these signs and symptoms. Pulses are verified at the levels of common femoral, popliteal, dorsal pedal and posterior tibial arteries. Other signs of diminished vascularization are checked as well, by e.g. capillary refill. When, after physical examination, there is suspicion of peripheral artery occlusive disease, additional duplex ultrasound is planned. When hemodynamically significant stenoses are found in the iliaco-femoro-popliteal tract additional contrast enhanced computerized tomography scanning is performed and subsequent invasive treatment is considered. Treatment may include PTA/stenting or bypass surgery and reasons for treatment may include the relief of symptoms accompanying symptoms caused by CRPS-I or to assure an appropriate wound healing after amputation.

Both vascular surgeon and physiatrist then propose the level of amputation. To prevent recurrence of CRPS level of amputation is chosen proximal of the area of allodynia (only based on clinical experience). Additionally functionality after the amputation is taken into account when deciding level of amputation. If the patient does not want to walk after the amputation the proposed level is based on optimal wheelchair mobility or on optimal nursing care. If the patient wants to walk after the amputation the proposed level is based on optimal functionality with a prosthesis. Further they re-evaluate the medication and discuss the pros and cons of an amputation. Also the risks and possible complications of an amputation are discussed. The rehabilitation process is explained (Fig. 2).

Multidisciplinary meeting

During the multidisciplinary meeting each professional summarizes his/her assessment and reports his/her opinion about the pros and cons of an amputation for this particular patient, the level of amputation and the expectations of the level of functioning after an amputation. These assessments are compared with wishes and expectations of the patient described in the letter of motivation. Based on the acquired information and discussion, a consensus based decision is formulated and the patient is informed by the physiatrist and the surgeon on the same day about the decision. If it is decided that an amputation is to be performed the patient is put on a waiting list for the procedure and generally an amputation is performed within two months after the multidisciplinary meeting. If no amputation is advised reasons will be extensively explained to the patient. Depending on the outcomes of the multidisciplinary meeting, further diagnostics and or additional (pain) treatments may be proposed. The referring physician is informed about the outcomes of the multidisciplinary consultations and the decision.

Considerations

Patients suffering from longstanding therapy resistant CRPS-I generally request an amputation because of severe spontaneous pain often including allodynia, not controllable by means of treatment (medication, invasive pain procedures or other treatments according to the guidelines [16]. Pain prevents them in performing activities of daily life and personal care and participating in society (recreationally, professionally, as a partner or parent). The affected limb is often completely a-functional and referred to as “that leg” instead of “my leg”. The affected limb is no longer included in their body scheme. Patients cannot stand the pain anymore and want to become active again and want to participate in society. They want to “get rid of that limb”.

Patients are referred to the department of Rehabilitation Medicine of the University Medical Center Groningen (UMCG) for amputation because relevant health care professionals elsewhere in the Netherlands

are not amenable for amputation requests or miss expertise. Since 2000 amputations for this reason are performed in our center and due to ongoing research an expert center emerged.

Amputation of a limb is an irreversible and drastic measure, and it may have large consequences, negative as well as positive, for person and peers involved. CRPS-I may not be solved by an amputation, it may reoccur more proximally in the stump or in another extremity [1]. Because CRPS-I is associated with central nervous system alterations [37,38] an amputation may not result in the expected / desired pain reduction or functional gain. However, despite central nervous system alterations our amputation results were quite favorable. A reduction in pain following amputation was reported by 19 patients and for 18 of them it was a major reduction. But 18 patients reported residual limb pain and 18 experienced phantom limb pain which impeded them much to very much in 6 respectively 7 patients. Despite residual limb pain and phantom pain 18 out of 21 patients would chose an amputation again [2]. However, recently, a case-report documented a patient who had undergone an amputation because of CRPS-I but who now advocates against amputation [39]. Taking the above in to account the decision to amputate in case of longstanding therapy resistant CRPS-I is difficult. By weighing all pros and cons carefully by professionals and patient in an expert center the chance of making decision which is beneficial for the patient is increased. Overlap in topics of assessments of the professionals involved exists to be sure that consistent information is acquired during the whole decision making procedure.

Reasons not to amputate are psychiatric disorders such as BIID, conversion or auto-mutilation, addiction of the patient to medication, alcohol or drugs, a previous amputation because of CRPS-I, patient expectations are unrealistically high, professionals do not expect functional or quality of life improvement due to an amputation. After the discussion the patient is informed. Most referred patients themselves already decided that they wanted an amputation. Their decision is more or less made independently from peers or health care professionals [17]. If the decision of the team differs (no amputation) from what they want (amputation), the decision is extensively discussed and explained. Sometimes patients are (very) disappointed and they visit another hospital to request for an amputation.

Overall level of evidence for effects of treatments of CRPS-I is low. Level of evidence for effects of amputation in case of therapy resistant CRPS-I is even lower. Additionally, because patients referred for amputation are strongly motivated to undergo that amputation it is difficult to perform a randomized controlled trial. Hence level of evidence in favor or against an amputation will remain low. Predicting poor or successful outcomes after amputation in case of therapy resistant CRPS-I accurately, is currently not possible.

We described and presented the multidisciplinary decision making process as prevailing in our university center in detail, with respect to amputation in therapy resistant CRPS-I patients. Our experience is based on a period of 24 years with patients that are referred from whole the country (the Netherlands). In this way we hope to contribute to an open discussion about this difficult and delicate matter.

Author contributions

Author contributions P.D, E.S. and J.G. designed the concept. All authors discussed the concept, wrote parts of the manuscript, revised the other parts, read and provided final approval of the paper.

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Conflict of interest

None declared.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.mehy.2018.08.026>.

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